

Jenkins (J. F.)  
American Social Science Association.

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# TENT HOSPITALS.

READ BEFORE THE AMERICAN SOCIAL SCIENCE ASSOCIATION, MAY 21, 1874.

BY J. FOSTER JENKINS, M. D.

*ILLUSTRATED WITH FIGURES.*

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THE JOURNAL OF SOCIAL SCIENCE has been hitherto an occasional publication, appearing at irregular intervals, but usually once a year. During the years 1872-3, only one number was published: in 1874 two have been issued. It is hoped hereafter to publish it semi-annually, and perhaps oftener, so as to furnish in each year a volume of at least 500 pages to the members of the Association, and to those individuals and libraries that may prefer to receive it by subscription. It will be published at the rate of One Dollar for 200 pages, however often it may appear, and subscriptions for the numbers at that rate may be sent either to the publishers, or to the editor (F. B. Sanborn, 5 Pemberton Square, Boston), the Secretary of the Association.

The Journal includes, in the first place, the Transactions of the Association; that is, the proceedings at its meetings, general or special, the papers read at those meetings, and such reports of the discussions as are made; and in the second place, other papers prepared for the Association, or relating to its work. Numbers Six and Seven, for instance, contain nearly all the papers read at the New York Meeting in May, 1874; and also, other papers or extracts from papers relating to the topics treated at that meeting. For the convenience of subscribers, certain topics are grouped together in Number Six; as, for example, those relating to Public Charities and Finance; others, relating to Public Health and Education are grouped in Number Seven. The latter also contains a record of facts and events, at home and abroad, which may be supposed to interest students of Social Science. All such, and particularly members of the Association, are invited to contribute statistics, reports, or any data whatever which can properly find a place in the Journal.

Number Six was published in July, 1874; Number Seven in September, and Number Eight may be expected early in 1875. Number Five was published in October, 1873. The table of contents of Numbers Five and Six is appended. Number Seven contains the papers on Sanitary subjects read at the New York Meeting; the papers of Presidents Woolsey and White, and other important matter. Number Eight will contain the proceedings of the Annual Meeting in October; the reports, papers, and discussions thereat, and some account of the British Social Science Congress at Glasgow.

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American Social Science Association.

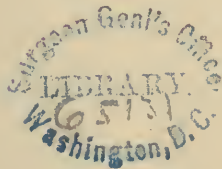
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## TENT HOSPITALS.

A PAPER BY J. FOSTER JENKINS, M. D., OF YONKERS, N. Y.

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THE bitter experience of the allied armies in the Crimea, engaged, during 1854-55, in war with Russia, fixed attention as it had never been before, upon the need of radical reforms in hospital construction.

The report<sup>1</sup> to the English Minister of War of the proceedings of the Sanitary Commission dispatched to the seat of war at the East, the writings of Miss Florence Nightingale, and finally the report,<sup>2</sup> in December, 1857, of the Commissioners appointed to inquire into the regulations affecting the sanitary condition of the army, the organization of military hospitals, and the treatment of the sick and wounded, furnished an array of facts and arguments, which went far to illustrate and establish the principles, from a general acceptance of which alone beneficent reforms could spring.

The subsequent experience of the British forces in India,<sup>3</sup> that contributed by the recent war of the American Rebellion, and by the campaigns of the French, German, and Italian armies since 1866, and the active discussion that has sprung up in England, France, Germany, and in the United States, of the special questions pertaining to hospital hygiene and administration as influencing the growth of correct principles of hospital construction, have each made valuable additions to our knowledge, and have rendered it well nigh certain, that coming generations of men, when they look upon hospitals hereafter endowed by the benevolent, need not be forced to lament that the pious intentions of founders should be frustrated by the ignorance of builders. For not in a single generation or country alone has it been an open question,

<sup>1</sup> *Report to the Right Hon. Lord Panmure, G. C. B., etc. Minister at War, of the Proceedings of the Sanitary Commission dispatched to the Seat of War in the East. 1855-56. Presented to both Houses of Parliament by Command of Her Majesty, March, 1857.* London: Printed by Harrison & Sons.

<sup>2</sup> *Report of the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army, the Organization of Military Hospitals, and the Treatment of the Sick and Wounded; with Evidence, and Appendix. Presented to both Houses of Parliament by Command of Her Majesty.* London: Printed by Eyre & Spottiswoode for Her Majesty's Stationery Office, 1858.

<sup>3</sup> *Report of the Commissioners appointed to inquire into the Sanitary State of the Army in India with Précis of Evidence. Presented to both Houses of Parliament by Command of Her Majesty.* London: Printed by Eyre & Spottiswoode for Her Majesty's Stationery Office, 1863.

whether the sick were the more helped or injured by residence in the average, nay, in the best-existing hospital.<sup>1</sup>

Miss Nightingale, even so recently as in 1863, said,<sup>2</sup> that strange though it seems, it is yet quite necessary to lay down the principle that the very first requirement in a hospital, is that it should do the sick no harm, — necessary because the actual mortality *in* hospitals is very much higher than any calculation founded on the mortality of the same class of diseases among patients treated *out of* hospital would lead us to expect. And a knowledge of the serious influence exercised by hospital construction on the duration of illness and the rate of mortality, led her to present to the English National Association for the Promotion of Social Science, the paper which, reprinted as *Notes on Hospitals*, has through successive editions, probably done more than any other treatise to promote sound views of hospital economy.

The English Royal Commission, appointed in 1857, for improving the sanitary condition of barracks and hospitals, indicated clearly in a few words the reason for which hospitals exist, viz. : “It should never be forgotten that the object sought in the construction of a hospital is the recovery of the largest number of sick men to health in the shortest possible time, and to this end everything else is only subsidiary.”<sup>3</sup>

How shall we, then, best build our hospitals so that they hasten rather than retard the convalescence of the ill, and will not add to surgical injuries and diseases brought into the hospital, the graver pests too frequently engendered there?

The outgrowth of the discussions of the past twenty years is a general assent that the sick man placed in hospital is likely soonest to be remanded to his ordinary course of life, who, other things, equal, finds himself in a structure consisting only of a single isolated ward, light, warm, and possessing an atmosphere of perfect purity, frequently renewed by thorough ventilation.

The condition essential to success here is the greatest attainable

<sup>1</sup> “It should never be forgotten for a moment, that on the purity of the air of a ward depend, in a great measure, the recovery or death of the sick and maimed, the usefulness or injury arising from the hospital, the duration of cases, and, consequently, the hospital economy; whether, in short, a hospital, planned, erected, and supported ‘by voluntary contributions’ is to be a blessing or a curse to civilization.” \* Quoted from Miss Nightingale, by Sir J. R. Martin, in *Holmes’ System of Surgery*, London, 1871, 2d edition, vol. v. p. 1012.

<sup>2</sup> *Notes on Hospitals*. By Florence Nightingale. 3d edition. London, Longmans, 1863. Page first of Preface.

<sup>3</sup> *General Report of the Commission appointed for improving the Sanitary Condition of Barracks and Hospitals*. Presented to both Houses of Parliament by command of Her Majesty. London: Printed by Eyre & Spottiswoode, for Her Majesty’s Stationery Office, 1861, p. 175.

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“\* Ponteau, looking at the ill-placed, ill-constructed and ill-regulated hospitals of his day, asks ‘Are hospitals, then, more pernicious than useful to society?’”

purity of the atmosphere, and to it all other questions should be but secondary. This determines the isolation of the ward, and forbids its association with another under the same roof. If larger numbers of sick are to be cared for than it is proper to aggregate in a single ward, another distinct structure should be provided. It will not do to erect a building of two stories, each a ward. By the poisonous emanations which it gives to its neighbors, and the limit it imposes on ventilation, each deprives the other of its prime condition of success,—a constantly pure atmosphere.

It is demanded, then, that aside from the erections demanded by the offices of administration, a hospital be composed of distinct structures of which, so far as shelter to the sick is concerned, the detached ward is the unit.

The number of wards under the same control constitutes the hospital a large or a small one. The only limits need be those determined by the number of the sick to be provided for, and the convenience of administration.

By what successive steps of experience and discussion students of hygiene have demonstrated that complete purity of air investing the patients, and, as essential to this purity, the isolation of the wards, are indispensable, need not be related in detail to this assemblage, even though the half hour allotted to this paper did not relegate to the limbo of appendix or foot-notes much citation of authorities and many illustrative statements.

I can, however, hardly forbear to cite in support of these general views the testimony of Dr. Parkes, Professor in the English Army Medical School, who has, among sanitary scholars and teachers of hygiene now living, hardly a peer. In the fourth edition of his treatise on Practical Hygiene, he says: "Although the establishment of hospitals is a necessity, and marks the era of an advanced civilization, it must always be remembered that if the crowding of healthy men has its danger, the bringing together within a confined area many sick persons is far more perilous. The risks of contamination of the air, and of impregnation of the materials of the building with morbid substances are so greatly increased, that the greatest care is necessary that hospitals shall not become pest-houses, and do more harm than good. We must always remember, indeed, that a number of sick persons are merely brought together in order that medical attendance and nursing may be more easily and effectly performed. The risks of aggregation are encountered for this reason; otherwise, it would be far better that sick persons should be separately treated, and that there should be no chance that the rapidly changing, and, in many instances, putrefying, substances of one sick body should pass into the bodies of the neigh-



boring patients. There is, indeed, a continual sacrifice of life by diseases caught in, or aggravated by, hospitals. The many advantages of hospitals more than counterbalance this sacrifice, but it should be the first object to lessen the chance of injury to the utmost. The risk of transference or aggravation of disease is least in the best ventilated hospitals. A great supply of air, by immediately diluting and rapidly carrying away the morbid substances evolved in such quantities from the bodies and excretions of the sick, reduces the risk to its minimum, and perhaps removes it altogether. But the supply of air must be enormous. In addition to the necessary amount to dilute and remove these substances, the freest supply of air is also now known to be a curative means of the highest moment; in the case of the febrile diseases, both specific and symptomatic, it is, indeed, the first essential of treatment; sometimes, especially in typhus and small-pox, it even lessens duration, and in many cases it renders convalescence shorter.<sup>1</sup>

“There can, I believe, be no doubt that the necessity for an unlimited supply of air is the cardinal consideration in the erection of hospitals, and, in fact, must govern the construction of the buildings. For many diseases, especially the acute, the merest hovels with plenty of air are better than the most costly hospitals without it.”<sup>2</sup>

He also quotes with approval the doctrine enunciated by Miss Nightingale, that “the sick should be placed in small, detached, and perfectly ventilated buildings, so that there is no great number of persons in one building, and there should be no possibility of the polluted air of one ward passing into another.”<sup>3</sup>

The Department of Health of this Association, when inviting the preparation of a paper upon tent hospitals desired, I presume, to elicit a discussion as to the applicability of tents to the hospital requirements of civil society, rather than to ask further consideration of their uses for the temporary shelter and treatment of disabled men in time of war.

In a thousand growing towns and incipient cities of the United States, to say nothing of those larger cities whose petrified embodiment of old errors in hospital construction yield steadily their harvests of disease and death, there is to-day an urgent need of better provision than exists for the care of such members of the community as, disabled by sickness or accident, most fitly rely on the local hospital to raise them from the class of dependents and consumers into that of helpers and producers.

It were idle to occupy the moments in reasserting the well-known

<sup>1</sup> See evidence on pages 276, 277. 9, 10.

<sup>2</sup> *A Manual of Practical Hygiene, intended especially for Medical Officers of the Army and for Civil Medical Officers of Health.* By Edmund A. Parkes, M. D., F. R. S., etc., etc. Fourth edition. Philadelphia, Lindsay & Blakiston, 1873, pp. 326-328.

<sup>3</sup> Op. Cit. p. 328.



truths that society cannot afford to lose the pecuniary value of the life or health of any citizen, and that it finds in every possessor of a sound mind in a sound body, a positive addition to its social forces. Its interests, not less than humane sentiment or its sense of duty, call for its intelligent appreciation of the principles of hospital construction, on which the success of all hospital administration is dependent.

I hope to show in this paper that tents are probably not less suited to satisfy the requirements of permanent civil hospitals than to meet the exigencies of war; that warmth and light and pure air can be secured to their occupants, and that so they satisfy the prime necessity of hospital construction, viz.: that in them the largest number of sick may be restored to health in the shortest possible time.

The proposition advanced, you observe, is qualified, and in place of demonstration, there can only be offered you such *à priori* reasoning on ascertained facts, and on the accepted doctrines of hygiene, and such limited, perhaps you will say inconclusive, experience, as has thus far been put upon record. The full acceptance of the proposition in its nakedness has been too recent; theory has as yet too seldom received material expression; the isolated canvas ward is too generally still an ideal creation, and comparative statistics of the duration of sickness and of the rates of mortality in the new structures and in the old, have not been accumulated in a sufficient body to satisfy the rigorous demands of scientific demonstration. Were the doctrines not only established, but generally accepted, this Association would scarcely call attention to them.

Although occasional allusions to the use of tents for hospital purposes are noticed in the writings of Ambrose Paré,<sup>1</sup> Monro,<sup>2</sup> Hen-

<sup>1</sup> In *Apologie, et Traité contenant les Voyages, etc.*, "Voyage de Metz, 1552," of the German camp after the raising of the siege he says: "On alla où ils avoient campé, ou l'on trouva plusieurs corps morts non encore enterrés, et la terre toute labourée, comme l'on voit le émitière saint Innocent durant quelque grande mortalité. En leurs tentes, pavilions et loges, yavoient laissé pareillement plusieurs malades." *Oeuvres complètes* Paris, Baillièrre, 1840-41, tome iii. p. 707.

<sup>2</sup> "Some of the regimental surgeons in *Germany*, when they took the field, had always some spare tents carried along with their medicine chests; and when any of their men fell sick in camp, and they could get no house for a regimental hospital in villages, they ordered these tents to be pitched, and had the ground within well covered with straw and blankets, and then put the sick into them, and then took care of them till they found an opportunity of sending them to the Flying Hospitals." *An Account of the Diseases which were most frequent in the British Military Hospitals in Germany, from January 7, 1761, to the return of the Troops to England in March, 1763, to which is added an Essay on the Means of Preserving the Health of Soldiers, and conducting Military Hospitals.* By Donald Monro, M. D. London, 1764, p. 355. . . . Monro also stated on the authority of Dr. Hume, that in 1755, some of the men-of-war carried out to North America a malignant jail fever, brought by impressed men. The fever continued to spread while at sea; but at Halifax the sick "were lodged in tents, or in very old, shattered houses, that admitted the air very freely, which put a sudden and effectual stop to this disorder." *Ob-*

nen,<sup>1</sup> and Larrey,<sup>2</sup> and although their summer use in Russia dates back more than forty years,<sup>3</sup> yet their especial value in the management of malignant epidemics was first exhibited on a large scale in 1855, at Varna, among the French troops smitten with cholera.<sup>4</sup> The smaller rate of mortality among the men treated in tents, less than twenty-seven per cent. of those attacked, as compared with those in buildings, sixty per cent., attracted marked attention.

*Observations on the Means of preserving the Health of Soldiers, and of conducting Military Hospitals; and on Diseases incident to Soldiers in the Time of Service, and on the same Diseases as they have appeared in London.* 2d edition. London, 1780, vol. i. p. 269.

<sup>1</sup> *Principles of Military Surgery.* By John Hennen, M. D., F. R. S. E. London, 1829, pp. 237, 238, and 243.

<sup>2</sup> *Memoires de Chirurgie Militaire, et Campagnes.* D. J. Larrey. Paris, 1812, tome i. pp. 244, 281.

It is noteworthy that the three hundred severely wounded men of the battle (reconnoissance in force) before el-A'rich, most of whom required the performance of surgical operations, who during continuous rainy and cold weather (February, 1799), were protected only by poor tents or boughs of the palm-tree from the humidity of the atmosphere and of the ground, who were deprived of their usual food and compelled to substitute for it the flesh of wounded camels and horses, yet generally bore their wounds and operations well. "Mais en général elles furent toutes suivies de succès."

The reconnoissance was followed after a few days by a brief siege of the fort of el-A'rych. Here "suitable premises" (un local convenable) were prepared to receive and treat the wounded. These wounded rejoined the army — à l'exception de quelques uns qui moururent de la peste. Was not the open-air treatment of the earlier wounded probably their protection against the maladies that so often assail aggregations of men after operation? Would the second company of wounded have been as likely to have had their ranks thinned by malignant fever under poor tents, as in the "suitable premises" which doubtless protected and perhaps decimated them? *Vide Larrey, Op. Cit. vol. i. pp. 280, 285.*

<sup>3</sup> "It seems that, whether in imitation of the mountain tribes of the Caucasus (where the practice has prevailed from time immemorial) or not, the Russians have been in the habit during summer of resorting to the tent system for the last forty years. Not only in the great camps near St. Petersburg, Warsaw, etc., are the patients placed in this description of ambulance, but all the civil and military hospitals possess a similar mode of establishment for the summer months. Of course, in winter, the great object, in so rigorous a climate, is by any means to exclude the cold; and as this has to be effected at the expense of ventilation, the consequence is, that not only the vast hospitals of the town, but the smaller ones, and even private houses, become infected, and erysipelis, gangrene, and pyæmia, typhoid and recurrent fevers are produced. Among the lower classes and the soldiers, hemeralopia and scorbutus become prevalent; and although all the usual remedies are resorted to, there is but one means of radical cure, the admission of air. The evacuation of hospitals, ambulances, etc., is therefore effected as soon as this becomes possible; and to this end every Russian hospital is in possession of light wooden constructions, or tents are raised in large gardens or plantations, and sufficiently remote from habitations, under the designation of summer hospitals. Scorbutus and hemeralopia now disappear as if by enchantment, the wounds take on a healthy aspect, and epidemics disappear." — Dr. Oscar Heyfelder, *Medical Times and Gazette* (London), June 10, 1871, from *Presse Belge*, May 7 and 14, 1871.

<sup>4</sup> *La Guerre de Crimée, les Campements, les Abris, les Ambulances, les Hôpitaux, etc., etc.* Par L. Baudens. Deuxième édition. Paris, 1858, pp. 187, 188, and M. Michel Lévy in *Bulletin de l'Académie de Médecine*, 1862, p. 617.

The statistical statement of M. Lévy, which is relied on in the text, is quoted from the

In 1861, Dr. Kraus, an Austrian military surgeon, published records of the experience of the Austrian army,<sup>1</sup> where since 1854 tents had been, during the mild season of the year, in growing use for hospital purposes. The report of this experience is so pertinent to many of the questions which are suggested by the present discussion, that portions of it may here be fitly presented. I quote from the abstract of it made for the parliamentary blue-book, containing the statistical, sanitary and medical report of the medical department of the British army for 1862: <sup>2</sup>—

“In 1854, at some of the stations of the Austrian army in Hungary, the plan was commenced of treating a portion of the patients under tents instead of in the permanent hospitals, and this was continued from spring to the end of autumn.” “The results were very satisfactory. The most severe maladies ran their course much more mildly in the free air, *i. e.*, in tents, and recovered more quickly and more perfectly than in the confined spaces of hospitals.” In the following years till the date of publication, the plan was continued, and the tents were kept open farther into the winter, and it was noticed that by a sudden burst of cold weather, when the thermometer fell to freezing point at night, the sick were in no degree damaged, and singularly enough, the men themselves, many of whom were severely ill, declined the offer to move them from the tents into the hospital. Taking the experience of the six years (1854—1860) the following results were brought out:—

*Typhoid fever.*—In its severe forms was treated more successfully in tents than in the hospitals. Less than twenty-one per centum of admissions proving fatal in tents, while thirty and a half per centum of those admitted into the permanent hospitals died. Attendance, diet, and medicine, were the same in both, and it was to the disadvantage of the tents that they were used during the worst months of the year for typhoid, August and September, when the severest cases were admitted. As regards the course of the disease, it was shorter in the tents; there

*History of the American Ambulance Established in Paris during the Siege of 1870-71, together with the Details of its Methods and its Work.* By Thomas W. Evans, M. D., D. D. S., Ph. D., etc., etc. London, 1873, pp. 479, 480.

The report of Dr. Edward A. Crane, on the *Organization of the American Ambulance*, which extends to nearly 500 pages of this imperial volume, is a monument of well-directed devotion too seldom encountered in our literature. Its history of the establishment of army hospitals and of the use of tents, whether for shelter or for the hospitalization of the sick, is well nigh exhaustive. It shows great familiarity with the writings of physicians and sanitarians on proper provision for the sick and wounded. And its discussion of the varied details of the special organization of the ambulance under consideration is eminently suggestive and thorough.

<sup>1</sup> *Das Kranken Zerstreungs-System.* Von Felix Kraus; K. K. Ober. Stabarzt. Wien, 1861.

<sup>2</sup> Army Medical Department. Statistical, Sanitary, and Medical Reports for the year 1862. London, 1864, pp. 347, 348, 349.

was earlier loss of headache, speedier lessening of the fever, and earlier moistening of the tongue. While in the hospital it was the third or fourth week before decided and permanent improvement set in, this occurred in tents by the fourteenth day. It was also noticed that in spite of the severity of the cases in August and September, there was no spreading of the disease in the tents.

*Small-pox.*— In the tent cases the eruption came out quicker and better, matured more rapidly, and the desiccation and convalescence were not followed by any sequence. In the permanent hospital the course was longer, the stages less defined, recession of the eruption was more common, after diseases were more frequent.

*Syphilis.*— In the wards, bubos, even when opened at the proper time, showed, in the hot summer months, a tendency to, or an actual production of gangrene. As such occurrences happened extremely rarely in the tents, it became a practice at once to remove such patients from the wards to the tents, and with very favorable results; there appeared to be an improvement in vitality.

*Wounds and Outer Inflammation.*— Of all the cases treated in tents, these showed the most favorable results. In 1859, a number of wounded (789) were sent from Italy; all severe cases were sent into tents; the slighter cases into wards.

All the men in the tents had a fresh, lively look, which contrasted very strongly with the appearance of those in the wards. In the wards, though doors and windows were left open almost the entire day, and the greatest care was taken with treatment, hospital gangrene occurred, and when the gangrened parts separated the granulations were unhealthy. All this was mended at once when the men were brought into the tents; the gangrenous parts separated more rapidly, and there was afterwards a more rapid reproduction. In no single case could it be ever made out that gangrene originated in the <sup>at</sup> tent.<sup>1</sup>

Not less important is the fact that no case of pyæmia occurred in the tents, and the production of tuberculosis, hydræmia, etc., following wounds was trifling. There was no death among any of the wounded treated in tents.

*Scurvy.*— In 1860 there was a good deal of scurvy; the improvement occurring in tents over that seen in the hospital was well marked.

In view of these results, Dr. Kraus strongly advocates the use of tents for field hospitals in war, instead of converting buildings (often unsuited for the purpose) into hospitals.

Dr. Kraus alludes to the usual opinions that tents are too hot, too

<sup>1</sup> See similar testimony of American experience as given by Dr. Hammond, Surgeon-general of the United States Army, p. 302. // Compare also the experience of Hennen at Abrantes (Rosçio), referred to on page 275. §.



cold, too exposed, or likely to be wet, and he justly considers all these objections to be of no practical value. They are, in fact, usually *à priori* conclusions by persons who are not well acquainted with tent life.<sup>1</sup>

The war of the Rebellion from 1861 to 1865 furnished the opportunity to apply in the United States, on a gigantic scale, the teaching presented by recent European experience. The tent hospital, either through necessity or by choice, was established under a great variety of conditions, and the tests to which it was subjected, have, in their result, afforded to the lessons of that teaching an ample support. The medical officers of the national government and of the insurrectionary States gave accordant judgment.

The Surgeon-general of the United States Army, Dr. Hammond wrote in 1863, in the third year of the war, "Nothing is better for the sick and wounded, winter and summer, than a tent, or a ridge-ventilated hut. The experience gained during the present war establishes this point beyond the possibility of a doubt. Cases of erysipelas, or of hospital gangrene, occurring in the old buildings, immediately commenced to get well as soon as removed to the tent. But in ~~no~~<sup>one</sup> instance that has come to my knowledge has hospital gangrene originated in a wooden pavilion hospital, and in no instance, so far as I am aware, in a tent. Again, wounds heal much more rapidly in them, for the reason that the full benefit of the fresh air and the light are obtained. Even in fractures the beneficial effects are to be remarked."<sup>2</sup>

Dr. Chisholm, a confederate surgeon, wrote during the war: "Men treated in a tent hospital always convalesce much more rapidly than those collected together in a large hospital building."<sup>3</sup>

<sup>1</sup> "We did not find, during the Crimean war, that free ventilation in our temporary hospitals was injurious. I can vouch for having treated and seen treated many cases of inflammatory affections of the chest in such hospitals without injurious effects. Men suffering from bowel affections were most liable to the influences of cold. During the Franco-German war, the soldiers have been very largely exposed to the full effects of the weather; yet up to an advanced period of the winter, the percentage of sick in the well-fed and well-clothed German army was small. A degree of warmth that is unnecessary for health, however, adds to comfort, and to a reasonable extent should certainly be afforded. In civil life, where the extremes of age, and delicate people, are so largely inmates of hospitals, a greater degree of warmth is requisite; *but this can be fully obtained in a well-ventilated building.*" *Notes on Hospital and Barrack Construction and Ventilation.* By Deputy Inspector-general Massy, M. D., C. B., Head of the Sanitary Branch. Appendix No. II. to *Army Medical Department Report for the Year 1869.* Vol. xi. London, 1871, p. 242.

<sup>2</sup> *A Treatise on Hygiene, with special reference to the Military Service.* By William A. Hammond, M. D., Surgeon-general United States Army, etc., etc. Philadelphia, J. B. Lippincott & Co., 1863, pp. 397, 398.

<sup>3</sup> *Manual of Military Surgery,* 1862. Quoted by Dr. E. A. Parkes in *Review of the Progress of Hygiene during the Year 1862.* Army Medical Department. Statistical, Sanitary, and Medical Reports for the Year 1861. London, 1863, p. 334.

At the same time, on the other side of the world, evidence was gathering of the superiority of tents over the older constructions for the care of the disabled, as was shown by Mr. Mackinnon, Sanitary officer to the English troops engaged in war with the Maories of New Zealand, during 1863-4-5, in his report to the Director-general of the Medical Department of the Army. He asserted that "it was observed by all the medical officers who had opportunity of judging, that the wounded progressed more favorably in tents."<sup>1</sup>

After the short, sharp, and decisive conflict, between Prussia and Austria in 1866, each Prussian hospital had its annex of a tent ward, in which were placed the worst cases, particularly those in which there was much suppuration. The indispensableness of abundant fresh air to the safe treatment of hospital gangrene, compelled the resort in such emergencies to the easily ventilated tent.<sup>2</sup>

Within the ten years that had now succeeded the report to the English Government of its Crimean Sanitary Commission, correct doctrines as to hospital construction, borne witness to so continuously by the result of their application, under the emergencies of war in Hungary, Bohemia, Italy, New Zealand, and the United States, had so won their way, that here and there, especially on the continent of Europe, civil surgeons began to promote the establishment on a small scale of tent hospitals to meet the ordinary requirements of urban populations. Foremost in developing practically the new ideas was Germany,<sup>3</sup> where, as M. Husson reports in a paper read by him in 1869 to the

<sup>1</sup> *A Brief Narrative of the War in New Zealand during the Years 1863, 1864, and 1865, embracing the Sanitary History of the Force.* By William Alexander Mackinnon, C. B., etc., Sanitary Officer of the Troops. Statistical, Sanitary, and Medical Reports, vol. vi. for the year 1865. Army Medical Department. London, 1857, p. 408.

Inspector-general Mouat, in his report on Wounds and Injuries received by troops in New Zealand during 1863-4-5, says: "During the war there was one place at which for a short time, wounds did not do so well—at Tauranga. There the wounds were inclined to take on unhealthy action; the flaps of stumps sloughed, secondary hemorrhage appeared, and the men generally did badly. The cause was evident, and as it admitted of prompt remedy, Tauranga became as healthy as any other hospital. The wounded had been placed in a very comfortable house, where plastered wall and ceilings effectually prevented the irregular ventilation which was so beneficial in its effects at Queen's Redoubt Hospital. The house acquired the sickly hospital smell, which was ineradicable; disinfection did no good, and yet the entire cubic space allowed to each patient was not less than eight hundred feet. The patients were, most of them, removed from this house, placed in marquees, and at once everything changed; the most unpromising wounds did well, and no more satisfactory cures could have been achieved elsewhere." Deputy Inspector-general Massy in English Army Statistical, Sanitary, and Medical Reports for the year 1869. Vol. xi. London, 1871, p. 234.

<sup>2</sup> Report on the ~~English~~ <sup>Medical</sup> and Sanitary Services of the Prussian Army during the Campaign in Bohemia, 1866. By J. A. Bostock, M. D. Army Medical Department. Statistical, Sanitary, and Medical Reports. Vol. vii. for the year 1865, London, 1867, p. 361.

<sup>3</sup> *Medical Times and Gazette.* London, Feb. 6th, 1869, p. 145.



Academy of Medicine of Paris,<sup>1</sup> the hospital authorities in all the principal cities erected tent hospitals in their gardens. The surgeons were almost unanimous in their declarations that the results of amputation, and other grave operations, were extremely favorable as compared with the operations in the older hospitals, and M. Chantreuil has reported the statistics of these establishments in the *Archives Générales*, and shown that successful results after operations on patients treated in tents are far more frequent than when they are the inmates of the ordinary hospitals. M. Husson, who held at Paris the important position of Official Director of Public Assistance, closed his paper at the Academy by commending a cautious but complete investigation of the subject of tent and shed hospitalization.

Aided by his encouragement, M. Le Fort, surgeon to the Cochin Hospital, soon established in its ample grounds a tent ward of eighteen beds, and with results the most favorable to its inmates.<sup>2</sup> In a Paris hospital, where capital operations and grave accidents so generally lead to the autopsy chamber, by reason of the preventable diseases induced by the contamination by organic emanations of everything about the patient, it was a new experience to see considerable numbers of severe injuries get well without a single complication of pyæmia, erysipelas, or hospital gangrene.<sup>3</sup>

Thus far, while tents had been growing in favor for the hospitalization of the sick, during the warmer portion of the year, a general conviction obtained that they were unfit to subserve this end during cold weather. Despite occasional statements of their successful use in winter, little effort was made to install them as sedentary hospitals, and where most valued during the milder season they were speedily evacuated with the first severe frost.

The Franco-German war of 1870-71, and the siege of Paris, gave an opportunity to our countrymen resident in Paris to test the conviction which some of them strongly held, that hospitals could be maintained under canvas, not merely in summer, but would as well meet the exigencies of winter service. Associating themselves as the American International Sanitary Committee of Paris, they established a fixed hospital on the border of the Bois de Boulogne, three wards of which, containing twenty-six, twenty-eight, and ten beds, respectively, were composed of canvas tents. The two larger wards, made by the union of several United States regulation hospital tents, were pavilions of cotton duck, seventy and eighty-four feet long, having a width of fifteen feet.

<sup>1</sup> *Medical Times and Gazette*. London, August 21st, 1869, p. 227.

<sup>2</sup> *Medical Times and Gazette*. London, November 27th, 1869, p. 639, and May 28th, 1870, pp. 590, 591.

<sup>3</sup> *La Chirurgie Militaire, et les Sociétés de Secours, en France et a l'Etranger*. Par Leon Le Fort, etc., etc. Paris, 1872, pp. 180-182.

A vestibule at each end protected the inmates from sudden drafts of cold air. The tents were furnished with board floors and covered each with a *sur-tente*, or fly. The ingeniously contrived plan of heating the wards by a subterranean furnace at the front of each, whose smoke pipe ran in a covered trench (communicating by registers with the interior of the tent), the whole length of the pavilion, and emerged from the ground outside its rear wall, secured an equable temperature, and abundant ventilation, conditions that previously it had been thought difficult to reconcile under canvas during cold weather.

Although the American ambulance made additional provision, by tent barracks and a house converted to hospital use, for the wounded committed to their care, the place of honor was ever assigned to the tents, — the most severe cases being treated there, — while the slightly wounded and the convalescent were bestowed in the other structures.

The barracks, too, served for the various offices connected with the hospital administration.

The results of this experiment vindicated its wisdom. From September to March, embracing a winter of unusual severity, the tents were warm except when fuel could not be had; were light, easily ventilated, and all the time free from the slightest indication of infection by emanations of organic poison, and from hospital diseases dependent on aggregation, while the death rate was, compared with that of other Paris ambulances, exceptionally low.

Dr. Gordon, sent on a special mission to the French army by the Secretary of State for war, and who remained in Paris during the siege, after deploring the fact that during the late war the results of operations were generally very unfortunate, did not hesitate to state that "within Paris we had, however, in the American Ambulance, undoubtedly the most favorable result of any."<sup>1</sup>

Why was this? Dr. Crane, the Secretary of the Committee, states that "the conditions under which the wounded men were treated at our ambulance differed in no essential respect from those existing in the other ambulances at Paris, except in so far as the patients were more directly exposed to the influence of the open air. The food used by us was no better than that employed elsewhere; the medicines were the same, and the surgical treatment was essentially the same."<sup>2</sup>

Again, effectively presenting some arguments for canvas hospitals, he says: "If most satisfactory results have followed the treatment of the wounded and sick in tent hospitals, it has been principally because they are more completely capable than any other hospitals of a constant and natural ventilation. Formed of a tissue permeable to air and gases, the vitiated air within them is constantly passing out, and is constantly

<sup>1</sup> *History of the American Ambulance*, etc., p. 491.

<sup>2</sup> *History of the American Ambulance*, etc., p. 494.

being renewed by fresh air which enters, not only through certain openings, but passes freely through the net-work of the covering itself. During a considerable portion of the year the doors may be opened, and the walls of the tent so raised as to enable the patients to pass many hours of each day in the open air. In the colder season, when it may be necessary to warm the tents, the air within them may be maintained even more constantly pure; since, whenever the temperature of the air within a tent is raised to a degree above that of the air without the air within the tent begins to escape, or rather is forced into the surrounding atmosphere, from which, in turn, it is necessarily renewed; and the rapidity of the outgoing and incoming currents of air will increase with the difference existing between the temperature within the tent and the temperature of the atmosphere at large. In my opinion, where the difference between the interior and the exterior temperature is from 30° to 60° Fah., most of the vitiated air passes out through the tissue of the tent. However this may be, it is certain that at our ambulance, where we maintained a constant temperature of about 60° Fah. night and day — when we had fuel — the atmosphere within the tents seemed to grow purer as the weather became severe. Never at any time was a persistent odor to be perceived in the tents, except that of tobacco smoke; and it may be interesting to observe, that while this odor clung to the tents during the mild days of the winter, it rapidly escaped whenever the weather was frosty. I believe the greatest advantage from a sanitary point of view to be derived from the general use of tents in the hospitalization of the sick and wounded, depends upon the facility with which the atmosphere within them may be kept pure and wholesome, and the common results of overcrowding avoided. Another very probable cause of the excellent results obtained in tents, may be attributed to the circumstance of their occupants being constantly more or less exposed to the influences of direct light. When the sick are treated in the open air the influence of light upon them must be very considerable. How important a ~~fact~~ *fact* this agent may be, among the several known to be indispensable in order to have the best sanitary condition, it is difficult to say. We know, however, that without light the maintenance of health for any considerable time is impossible, and that its invigorating effects upon organic life in general, bear a constant relation to the directness or indirectness with which the light may reach it. If it be true that the light within a tent is not at any time, strictly speaking, direct sunlight, the light within a white cotton tent not only is in great part direct light, but the light is stronger — the tent being in the sunshine — than it generally is in any room receiving its light indirectly, and by reflection, as nearly all rooms do.<sup>1</sup>

<sup>1</sup> *History of the American Ambulance, etc.*, pp. 492, 493.

The thorough working out of these results was due largely to the intelligent prevision, energy, and devotion of Dr. Thomas W. Evans and Dr. Edward A. Crane, the President and Secretary of the American Committee, whose familiarity with sanitary science, and previous studies of hospital hygiene, led logically to this unreserved application of correct principles, which had indeed before been acknowledged as theoretically true, while they had been accepted and acted on only with half-hearted hesitation.

The installation of the American Ambulance in Paris, in 1870, seems likely to encourage new applications of these principles wherever a desire for the speediest possible restoration of the sick is recognized as demanding the best models of hospital construction.

What conditions must be united in such structures?

1st. The tent should be of cotton rather than of hemp or flax. Cotton canvas is permeable to air, while less permeable than linen or hemp to water. Its durability is also greater.

2d. They should have, resting on a bed of gravel or sand, closely-joined board floors of hard wood. These should be covered with good oil cloth, or other non-absorbent material, to prevent fluids sinking into the boards. It would lessen the necessity of frequent washing of the floors, while it might itself be frequently removed and washed. Preferably, the floor should be waxed and dry rubbed, or coated with paraffine.

3d. All hospital tents should have the double roof or fly not only for protection against rain at all seasons of the year, and against the heat of the sun in summer, but by thus keeping the inner roof dry, to promote ventilation especially in winter. The less active aeration of the tents in warm weather through the interstices of their walls may be supplemented by open doors, and in some forms of construction, open windows, which should be placed opposite to each other, and by the partial elevation of the walls of the tent, which should be so arranged as to be easily raised when required. Both the inner roof and the fly should have louvred openings near the ridge at suitable intervals as accessory means of ventilation.

4th. In cold weather the heating should be effected by stoves below ground at the front of the tents, transmitting their heat along covered trenches which carry the smoke pipes to the rear, and which communicate with the wards by grated registers in the floor. The ground once dried and heated, becomes a reservoir of heat which it gives off for many hours, even though the fire be extinguished, and thus a rapid fall of temperature is prevented.

To serve the necessities of a hospital other than those providing for the shelter of the sick, to house the superintendent, the nurses and servants, to bestow conveniently the kitchen, the laundry, the phar-



macry, and to satisfy the other needs involved in a hospital establishment, more solid structures may be added. Their disposition, it is scarcely necessary to say, should be directed by the requirements of hygienic laws, and especially by the supreme law that nothing be permitted to hinder the freest access of pure air to the wards.

Many questions which relate to the grouping of the wards and the administrative buildings of the hospital, the best dimensions of wards, their distance from each other, and much else pertaining to hospital economy, fitly find their discussion in special monographs, or general treatises on public hygiene, rather than in this presence.

Other questions as to the advantages and disadvantages of tents for permanent hospitals must await for their determination a more extended trial.

Questions of first cost, of the cost of subsequent management, of the occasional renewal of material, are not considered here because they are held to be secondary to the chief demand, that in its hospitals society should do the sick no harm.

It will be well, and it seems to me not unfruitful of much good, if this association shall by the discussion it may foster, put on fuller trial the propositions of our countrymen in Paris,<sup>1</sup> viz. : —

1st. "That tent hospitals may be employed alike in winter and summer in all temperate latitudes ; and

2d. "That they are *better* fitted at all seasons of the year for the treatment of the [sick and] wounded than more permanent constructions."

In the words of M<sup>r</sup>. Husson, "It suffices that the experiments already tried have furnished results so favorable as to induce us to resolutely enter upon a cautious but complete investigation. In view of an innovation concerning which ideas are scarcely yet formed, it behooves us to guard against both a blind enthusiasm which excludes all criticism and leads to pure illusions, and against that excessive reserve which is equivalent to immobility."

#### DESCRIPTION OF A TENT HOSPITAL.

*Taken chiefly from the Report of Dr. Edward A. Crane, printed in Dr. Evans's "History of the American Ambulance." 2*

In the plate appended may be seen a sketch of a tent designed by Dr. Thomas W. Evans, and in the construction of which, while endeavoring to secure those qualities particularly desirable in an installa-

<sup>1</sup> *History of the American Ambulance, etc.*, pp 478, 479.

<sup>2</sup> This work, being the Vol. I. of *Sanitary Associations during the Franco-German War*, is published by Sampson, Low, & Co., London, 1873.

tion that is to have a certain permanence, he has sought to remedy, so far as it might be done, the mechanical faults which are most likely to be reproduced in any attempt to construct a large, strong, sturdy tent, intended to be used as a sedentary hospital. This is, perhaps, the best model which has been thus far presented, of a tent designed for about sixteen patients. But fuller information as to the details of material and construction should be sought for in such discussions as those of Miss Nightingale, Sir J. R. Martin, Prof. Parkes, Captain Douglas Galton, M. Le Fort, and Dr. E. A. Crane. The pavilion proposed by Dr. Evans is constructed in the following manner:—

Six posts, square, four inches thick, eight feet seven inches long, are sunk into the ground two feet, on lines which are to correspond with the side walls of the hut. The second post is placed fourteen feet from the first, the third, fourteen feet from the second, the fourth, four feet from the third, for a reason which will appear; while the fourth, fifth and sixth, are fourteen feet apart. The sides of the tent are therefore sixty feet long. The upright posts are united on each side by square bars, rounded on the upper and outer angles, four inches thick; these are placed horizontally from the top of one post to that adjoining. The extremities of these bars are secured to the posts by means of sockets.

The two lines of posts are now united at each extremity by a cross-bar, which is square, four inches in diameter, and twenty feet in length. The two bars complete the inclosure of a quadrangle, sixty feet long by twenty feet broad. Each one of the end bars is propped by two upright posts, similar to those on the sides, placed four feet apart. These posts inclose the doorways. A vertical pole, nine feet five inches long, is now erected over the centre of each door-way, its foot resting in a metallic socket. This standard is five inches in diameter at its base, and three inches at the top, which is armed with an iron spindle; it is flattened on its outer face. Two masts, six inches in diameter at the base, and three inches at the top, and seventeen and a half feet long, are sunk in the ground one and a half feet, on a line corresponding with the long axis of the quadrangle, twenty feet apart. These masts are connected at the top, one with the other, as also with the vertical standard over the door-ways, by ridge-poles, three in number, and each twenty feet in length; the ridge-poles are rounded on their upper faces. The two end ridge-poles are fastened to the upright standards by being passed over the terminal spindles with which the standards are armed. The middle ridge-pole is attached to its fellows by means of sockets. The skeleton, or framework of the tent, is now complete. I have not remarked, however, an arrangement of considerable importance. Each one of the sixteen upright wall-posts, of the end standard, and of the ridge-poles, is furnished with a row of fixed metallic rings, whose diameter is about three quarters of an inch. These rings are screwed into the outer faces of the posts, six inches, or eight inches from each other, and all facing in the same direction, upwards and downwards; on the ridge-poles they face each other horizontally.

(See Figures 1 and 4.)



Such a frame-work having been erected, it remains to be provided with its covering. This consists of two sections, which are to be united when erected at the ends and at the ridge. Each section forms one long roof, two triangular gables, two end curtains and five side curtains. The curtains are all sewed to the edges of the roof, and also to the edges of the gable ends. The sides and bottoms of the curtains are provided with button-holes; so also are the vertical edges of the gable ends, and the superior edge of the roof; a narrow lapel projects beyond the line—the angle of the roof—where the roof and curtains meet; into this lapel are inserted the tent-ropes, two feet three inches from each other.

In erecting the tent, the sections are unrolled on the ground within the inclosure, the wall-curtains being drawn out toward the side posts, while the long straight edges of each—the edges containing the button-holes—are laid parallel to each other in the middle of the inclosure, along the line of its length. The long edge of one of the sections is now lifted up, and beginning at one of the extreme ends, the first button-hole is slipped over the spindle at the extremity of the standard over the door-way; the button-holes are fastened, one after the other, over the rings on the upper surface of the ridge-pole, until the edge of the section is adjusted along its whole length. The body of the section is then lifted up and over the horizontal bars—the plates of the frame-work—the curtains falling on the outside. The button-holes in the vertical edge of the gable end are adjusted to the rings in the standard over the door-way. The roof is drawn out by the cords attached to the lapel, and pegged to the ground in the ordinary way, or attached to parallel bars, as shown in the plate.

The curtains are now buttoned on to the ridge in the upright posts, one curtain edge over the other on the sides, the button-holes on the lower edge being passed over rings which are placed in the outer string-pieces on which the floor rests. (See Figure 1.) I may here say that, presuming it may not be always convenient to use a floor, the lower edges of the curtains are furnished with a series of loops, by means of which the walls can be pegged to the ground in the ordinary way. The canvas is held fast, and is prevented from slipping off the rings by passing a cord through the series, or by means of small keys, as shown in the illustrations.

I have elsewhere objected to the use of straps, buckles, etc., for curtain fastenings, because of the openings which almost always exist where such fastenings are employed; it is partly to reduce the number of such openings that the curtains have been attached permanently to the roof; it is for the same reason that the edges of two adjoining curtains have been buttoned, one curtain over the other, the edges of the curtains overlapping slightly for this purpose. In the curtain which rests upon the face of the post, the button-holes are four or five inches from the edge; the free border forms a roll beneath the outer curtain, in which the button-holes are close to the edge. The two curtains being pressed down solid by the keys, or the cord passed through the rings, this roll breaks or fills up the joints which would otherwise exist. The arrangement will be readily understood by a reference to Figure 2, where one curtain, *e*, is shown buttoned over the ring *b*, in the post *a*. The edge of the second curtain, *d*, is also buttoned upon *b*, and will be observed to have been

rendered slightly convex by the free edge of the curtain, *e*. Fig. 3 shows a section of the curtain, *e*, buttoned over the rings, *b b b*, with its free edge, *c*, rolled up. The curtain, *d*, may be brought forward and buttoned over, *b b b*, as shown in Fig. 2.

It is now necessary to arrange the fly. This is in three sections, each twenty feet broad, and about thirty feet long. It is in sections — *first*, that it may be the more easily adjusted; *secondly*, that the air between it and the roof of the tent may have a free outlet; this is desirable, not only because a better ventilation within the tent is thus maintained, but because the strain to which the fly, were it in one piece, would be subjected whenever the wind is high, is greatly lessened; *thirdly*, that, the season permitting, one or more sections may be advanced so as to form an awning in front of the tent. The three sections of the fly are placed upon the portion of the roof which we are presumed to have erected, each folded *outside in*; that is to say, each section being in its place, one half resting upon the portion of the tent it is to cover, the other half being thrown back over it. The fly having been thus placed for the moment, the section of the tent still supposed to be on the ground is lifted up, and beginning at the extreme end, the first button-hole is slipped over the spindle at the extremity of the standard over the door-way, and the button-holes, one after the other are fastened to the rings in the ridge-pole as already described. Before, however, the second section has been adjusted far, a small perforated block, or ball, two or three inches in diameter, is pushed down upon the spindle just mentioned, and the fly is pulled up, and the hole which will be found near its outer edge and corner is passed over the top of the spindle; as the second section of the tent is attached to the ridge-pole, the fly is drawn up and over on to the same side. Balls are placed on the spindles of the three remaining standards, after the two sections of the tent have been united upon them, and the flies are adjusted, as has already been described. The section of the tent is now brought forward over the framework, to which it is fastened, as in the first instance, and stayed out by cords similarly attached. The fly is then pulled down on either side, and fastened by cords to pickets driven into the ground, or to a bar, as shown in the Plate II. The fly is adjusted as in the common American hospital tents, except in not resting directly upon the ridge-pole; the balls placed upon the spindles separating the fly from the tent, permit the air to circulate more freely between it and the tent. (The ball is represented in Figure 4 by the letter *e*; its effect to separate the fly from the roof of the tent, *b*, will at once be seen.)

The tent, as now pitched, has four large unclosed openings; those at the ends are intended to be closed by light swinging doors; those at the sides with windows — not, however, necessarily, as will be seen by looking at the plate; a curtain can be drawn down to fill the space intended for the window, should it for any reason be difficult to obtain one. Ridge ventilation is provided for by louvres which can be opened or shut at pleasure. The ventilation will be chiefly secured, however, during cold weather, by the heating apparatus. During the warmer portion of the year, the side and end curtains can be rolled up, as shown in the plate; they are sustained by straps, which are employed when the tent is closed to attach the roof to the bars or plates which connect the upright posts.

The floor, if one is employed — and one always should be, if possible, in a permanent installation — it will be best to prepare before the tent is erected. The ground should be leveled; in fact, it would be well to remove six or eight inches of the top soil, and replace this with coarse gravel. String-pieces are then to be laid down lengthwise on the sides of the tent to furnish an attachment to the lower borders of the curtains; the other string-pieces should traverse the tent; they should be only large enough to support the floor, and should be forced into the gravel until their upper faces are level with its surface. When the flooring is laid, it will, therefore, rest directly upon the gravel. The floor will be made of rough unmatched boards, and it should always be covered by an impermeable oil cloth over its whole surface. Such a floor is perhaps as perfect as it is possible to have in a temporary hospital. It is solid, not dusty, contains no dead air beneath it; no foul matter can accumulate under it; it is non-absorbent of gases, and can always be easily and very perfectly cleansed.

But some one may ask, Why not allow the out-door air to circulate freely under the floor, as it did beneath the American barrack hospitals? This arrangement, permitting the out-door air to sweep them on every side, was supposed to contribute much to their healthfulness. But if the floor is impermeable, and contains nothing offensive under it, there is no reason why it can be desirable to secure a constant change of the air beneath it. Another and more weighty reason is this: if the out-door air were permitted to circulate freely beneath the floor of the tent, our ground heat during the winter would be lost. When the weather becomes cold, the tent should be heated by the introduction of hot air through a cellar and trench, the latter partially covered, and the heat being admitted through registers, as the tent pavilions of the American Ambulance at Paris were warmed during the winter of the siege. How important a factor this ground heat is, in the maintenance of a steady temperature within a tent was there shown. The doors, the upper portions of which may be furnished with windows, may be protected during the winter months by portals or vestibules. Paved gutters should be placed on each side of the tent.

It will be found advantageous to fix the tent in the manner indicated in Plate II. by attaching the tent-cords to parallel bars; not only is the inconvenience of cordage avoided, but the stability of the tent is thus assured. The tent is intended to accommodate sixteen patients. There is room for eighteen beds, but it will generally be found convenient to suppress two of these to gain room for furniture, etc. A tent constructed like the one described would be greatly superior to the American hospital tent for the organization of sedentary hospitals. It is much more spacious, and is relatively less costly. To form a pavilion fifty-six feet in length, four United States hospital tents are required. The canvas of the six ends which meet is superfluous; it is more than this, it is decidedly objectionable. It serves to form dead corners, and offers a large amount of material to be impregnated and infected by miasmatic exhalations. Dr. Evans's model is also peculiarly well adapted to serve as an annex to a civil hospital, not only for the treatment of surgical cases, but to meet the requirements of certain epidemics — cholera for example — the mortality incident to which disease is largely controlled by the general sanitary surroundings; and this fact was never more strikingly illustrated than in the Crimea, in the very first large tent hospital ever established.

PLATE I.



FIG. 1.



FIG. 2.



FIG. 3.

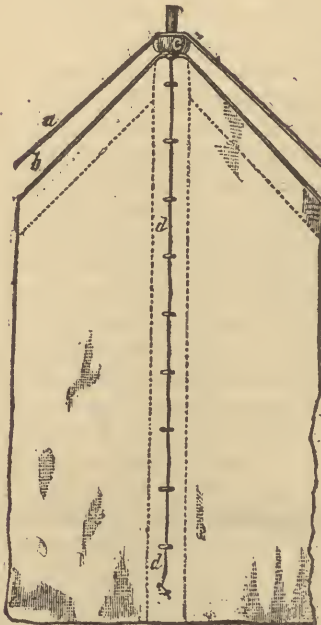
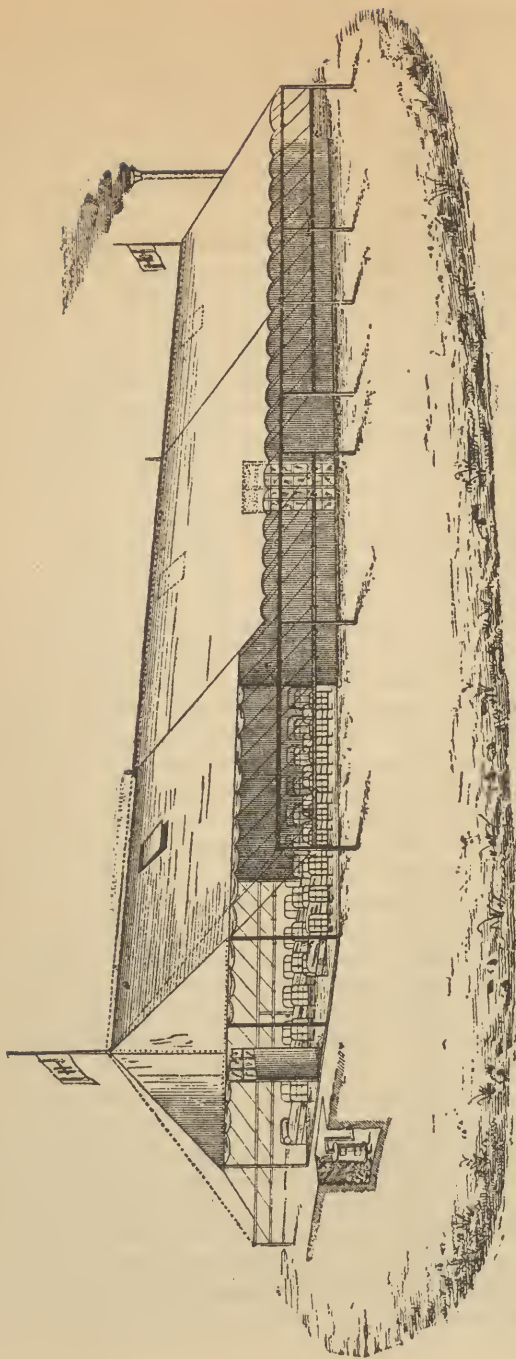


FIG. 4.



PLATE II.



## THE DISCUSSION.

DR. ELISHA HARRIS. This subject is broader than the mere questions of humane charity to the needy sick, or of economy in such charity ; for the public health is greatly concerned in the proper settlement of the principles and methods by which contagious and infectious maladies, like typhus, typhoid, and puerperal fever, scarlatina, relapsing fever, and small-pox, shall be rendered least harmful to populations among which they occur. The suggestions embodied in Dr. Jenkins's paper are eminently practical, for he presents a simple plan for the institution of small hospitals, or of hospital care upon any limited scale, from one bed to five hundred beds, to meet such exigencies as may arise in villages and cities, or in any other communities, though it be among woodsmen and miners, or work-people anywhere.

The importance of such readily organized and economical methods of care for the sick and hurt, and especially of sanitary protection for the residents of districts where the need of such humane care has come, is illustrated every few months in the vicinity of New York, and along all the great thoroughfares in our country. This need is felt, as well as that which is more permanently present, for the institution of "village hospitals." But as respects the temporary hospital, it must be devised upon some plan like this now suggested by Dr. Jenkins. Recently, and for a period of some eight months, small-pox has prevailed in numerous hamlets, and in great companies of work-people along the eastern counties of the State of New Jersey. In some towns the people have set apart an old house in the locality for a pest-hospital. In most towns no hospital or strict sanitary seclusion has been ordered. Yet it would have been easy to provide such sanitary care, and make it the occasion and means of teaching how to save life and stamp out a pestilence. In a populous and commercial town on Lake Champlain, there has been so great a pestilence of small-pox, the past two years, that vast public injury has resulted from the absence of such simple and temporary hospital facilities as Dr. Jenkins has here suggested. Even the mere purification and disinfection of the dwellings in which the sick were distributed, has cost more than an entire hospital and outfit that would have arrested the pestilence.

Even for so delicate a malady as puerperal fever, or so gentle surroundings as are required for the proper care of its victims, and for the protection of lying-in-cases, when and where the puerperal fever poison is prevalent, the temporary hut-hospital is a priceless boon to woman in the families of poor laborers. This might be thought the last of all resorts for safety ; but in many a town, and among many a poor shanty population of miners, laborers, or others, we have witnessed the want of temporary maternity cottages.

Listen to Florence Nightingale as she rehearses the reasons for adopting the simplest kind of structure for maternity wards, after noticing the causes that destroy the lives of from three to four per cent. of all mothers whose accouchement occurs in ordinary Lying-in-Institutions. She proves that in the rude huts which are devoted to maternity patients at the military barracks of Shorncliffe, out of 702 cases of accouchement, not a death has occurred from any puerperal disease, and only four from accidental causes. She remarks



that "it is an old wooden hut, of the simplest construction, with thorough ventilation. It is situated on a rising ground close to the sea, and facing it, so that the sea breeze sweeps right through it."

In Colchester (hut), there have been 252 registered deliveries and no deaths.

Experience has proved the practicability of establishing cottage hospitals for villages, and of hastily extemporized hospital apartments and simple shelter, and means of perfect care for the sick or hurt anywhere. We have at the Staten Island Cottage Hospital — the "S. R. Smith Infirmary" — and at the "Cooperstown Thanksgiving Hospital," perfect examples of success in this village hospital; and in England we can now count twenty such examples; while in the line of temporary and most hastily extemporized open-air hospitals, what could be more instructive than the testimony of our sanitary and surgical service in the late war? Who that visited the fields of Antietam, and saw among the seventy collections of wounded soldiers that model of canvas, and floored shelter at "Smoketown," under Dr. Vanderkief's direction; or who at Gettysburg saw the same practices repeated, or at Winchester saw the "Sheridan tent hospitals," will ever doubt the practicability of instituting perfect hospital care and securing the greatest saving of human life in the tent hospital?

In the Quarantine hospitals of the port of New York, in 1855-57, I caused the costly and imposing brick edifices which the State had made for hospitals, to be closed and locked, and removed all my patients into the narrow wooden shanties, which had ventilation at the roof, at the floor, and between all the beds. The mortality of small-pox, as well as fever, was only half as great in those narrow shanties as it had been in the costly piles of great broad halls in the brick edifices. The hospital ship, which was hastily fitted up under my superintendence in 1859, and which for ten years had an unexampled smallness of mortality, and never communicated any disease to the attendants and visitors, was flushed with fresh air, and was absolutely clean from stern to stem. It was an example of simple means which secure success in the care of the most infectious and deadly diseases.

In a report which Hon. Hamilton Fish, Senator from New York, made to the Senate some twenty years ago, there occurs the following recital of testimony in favor of tent hospitals. Having myself verified the facts by the aid of witnesses of the events recited, I beg leave to conclude these remarks by offering this as a kind of testimony which all citizens can fully appreciate. The chief portions of this testimony were contributed by Hon. James Parker and the late Dr. McKnight Smith of New Jersey.

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"In the month of August, 1837, a number of ships with emigrant passengers arrived at Perth-Amboy, N. J., from Liverpool. There was no hospital or other accommodation in town in which the sick could be placed, and no person would admit them into private dwellings, fearing the infection of the fever. They could not be left on board the ships. An arrangement was made to land the sick passengers, and place them in an open ward, adjacent to a large spring of water, about a mile and a half from town. Rough shanties, floored with boards and covered with sails, were erected, and the patients were taken from on board ship, with boats which landed as near the spring as they could

get, and carried them in wagons to the encampment (as it was called). Of the first thirty-six landed, twelve were insensible, in the last stage of fever, and not expected to live twenty-four hours. . . . The number of patients at the encampment was increased to eighty-two. The ship was cleansed after landing its passengers, and, on board *four* of the crew were taken with the ship-fever, and two of them died. Some of the nurses at the "encampment" were taken sick with the fever, but they recovered. Of the whole number of eighty-two passengers removed from the ship, *not one died*. Pure air, good water, and perhaps the rain — (though only the first thirty-six were affected by it), — seem to have effected the cure."

The ship here mentioned was the *Phæbe*, with between 300 and 400 passengers. A number had died on the passage. The open-air hospitals at the encampment, which were erected in a single day, were two in number, thirty by twenty feet, and boarded up about four feet from the floor, on three sides, and an awning roof of old sails spread on poles above. The carpenters proposed to prepare the coffins which the first twelve (insensible and apparently dying) patients would require; but no coffins were needed. The four sailors who sickened on board the ship, after the emigrants were landed, were removed to a comfortable dwelling-house in town, received good medical treatment, and yet two of them died.





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